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FOUNDRY TRADE JOURNAL
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Vol. 70 Thursday, July 15, 1943 No. 1404

Post-War Export Experts

Mr. J. C. Roche, the secretary of the Constructional Engineering Company, Limited, recently presented the Birmingham Branch of the Institute of Export with a cut and dried scheme for the training and selection of personnel for British foreign service. It was an admirable attack on an admittedly difficult subject, for as was envisaged the export business will be metamorphosed after the war. The author makes no allowance whatsoever for personal friendships entering into the question, and appears to replace this important factor by the institution of mass anglophobia throughout the world. Yet we cannot imagine that this will be an entirely satisfactory substitute. Mr. Roche seems to place more importance on a knowledge of the psychological make-up of the working classes in foreign countries than we deem necessary. The local buyer will explain in the fullest measure not only what the "man in the street" will purchase and the price he will pay for it, but will detail the quantity he can sell. The great difficulty, not only abroad but in this country also, is making contact with right men. In our own industry, it is useless trying to sell to a foreman plant, the purchase of which would be a matter for a directors' meeting, and conversely the managing director may not be interested in the potentialities of the latest core-oil. The essential requirements for a foreign representative, to our mind, are: (1) enthusiasm for the goods he sells; (2) ability to make himself understood with reasonable facility in the language of the country—exceptional fluency is not necessary; (3) to be a good "mixer"; (4) to be completely ignorant of and disinterested in the politics of the country he visits; (5) never to refer to his home land unless specifically asked a question; (6) to be enthusiastic about the life and conditions of the country in which he finds himself, and (7) finally to remain a foreigner, as it engenders and retains curiosity. These precepts are taken from our own personal experience, and it makes us wonder just what sort of training would induce such qualities. Only the largest firms can afford direct representation in all the markets where they can sell, and for the others it was usually a question of appointing an agent. Now we gather from Mr. Roche and general trends of opinion, that the "agent" is to be replaced by a new type of individual who will represent a group. The foundry equipment firms in common with other trades have such an organisation in being. The overseas representative they appoint will need all the attributes we have indicated, but how is he to be enthusiastic about the goods he sells, when he handles lines which are competitive in the home market? It is reasonable to believe he will take the line of least resistance and sell the plant which entails the least trouble, or if he is paid on turnover, the most profitable. By "least trouble" we mean that when one or more successful installations have been made of one make of plant, the representative will favour that type as confidence has been won. We fail to appreciate the necessity suggested by Mr. Roche of a special school or institute for the training of overseas representatives, but would prefer them to be selected from the technical sales staffs of industrial enterprises, as we cannot believe that any standardised training would specially fit a man for overseas representation. We have met many of the pre-war variety and have encountered but few misfits. Our feeling has been that these were too few, and they had perforce to leave much of their work to the local agents. On the consular side, we have found that where Britishers were in charge, they were particularly well informed as to the staple industries of the town, but lacked

(*Concluded on next page.*)

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INSTITUTE ELECTS NEW MEMBERS

At a meeting of the Council of the Institute of British Foundrymen held at the Waldorf Hotel, Aldwych, London, W.C.2, on June 25, the following applicants were elected to the various grades of membership:—

As Subscribing Firm Members

Nimr & Chapman, Limited, 124, Main Street, Bulawayo, Rhodesia (representative, E. M. Nimr); Phœnix Foundry, Limited, 87, Hay Street, Opherton, Johannesburg (representative, F. C. Millburn); Platt Malleable Castings, Limited, Clive Foundry, Leamore, Walsall (representative, G. Harvey); Kent Alloys, Limited, Commercial Road, Strood, Kent (representative, F. H. Hoult).

As Members

L. G. Beresford, Editor, "Metal Industry"; R. Blandy, managing director, R. Blandy & Company, Limited, Slough; W. M. Brown, draughtsman, East Rand Engineering Company, Limited, South Africa; L. Cook, melting shop manager, Karabuk Iron & Steel Works, Turkey; A. Emmerson, foundry foreman, McMillan's Foundry, Watford; W. H. Isbill, director, R. Blandy & Company, Limited, Slough; S. B. Michael, sales manager, Phosphor Bronze Company, Limited; R. P. Salmon, mechanical engineer, Eyre Smelting Company, Merton; A. Wotherspoon, works manager, East Rand Engineering Company, Limited; L. J. Yarnall, foundry manager, Castings, Limited, Walsall; C. W. Turner, foundry engineer, Walker, Sons & Company, Ceylon; E. J. Horner, ironfounder, Vryheid Iron Works, Natal; G. M. Logan, chemist, metallurgist and enamel technician, City Engineering Works, Pretoria; C. V. Patterson, secretary, Engineering Industrial Council, South Africa.

Transfers from Associate Members to Members

J. W. Gaunt, governing director, W. & J. Lawley, Limited, West Bromwich; D. W. Hammond, chief chemist and metallurgist, Crofts (Engineering), Limited, Bradford; J. R. Parker, foundry foreman, Hepworth & Grandage, Limited, Bradford.

As Associate Members

K. M. Brown, moulder and laboratory assistant, New Zealand Government Railways; S. Bojarczuk, technical officer, Polish Institute of Technical Research; A. H. Bynion, general moulder, Taylor & Challen, Limited, Walsall; F. G. Cooke, assistant foundry metallurgist, High Duty Alloys; T. Emmerson, moulder, MacMillan Foundries, Watford; A. L. Fletcher, foundry foreman, Powell, Duffryn Engineering Works; J. Flucker, resident engineer, Havelock Mine, South Africa; J. Goslin, foreman patternmaker, Phœnix Foundry Company, Johannesburg; G. C. Harris, moulder and research worker, British Malleable Iron Company, Halesowen; L. J. W. Hatch, foundry foreman, Meigh High Tensile Alloy, Limited, Gloucester; C. F. B. Hippisley, technical adviser and representative, Morgan Crucible Company; G. L. Jones, metallurgist, Williams Alexandra Foundry Company, Cardiff; R. Lax, draughtsman, East Rand Engineering Company, Limited, South Africa; G. Masters, moulder, T. Masters & Sons, West Bromwich; N. Pemberton, engineer draughtsman, Crane, Limited, Ipswich; A. L. H. Perry, metallurgist, I.C.I. (General Chemicals), Limited; C. Potter, assistant foreman moulder, Turner Tanning Machinery Company, Leeds; E. Raybould, foundry metallurgist, High Duty Alloys, Limited; C. Stoch, Lieut., Polish Army, Institute of Technical Research; W. A. Turner, sales manager, Kent Alloys, Limited, Strood; C. J. Williams, metallurgist, Magnesium Castings & Products, Limited; H. S. Boyder, secretary, Moulders' Union, South Africa; G. R. Day, foreman moulder, J. Stone & Company, Limited; A. T. Dean, Inspector H.M. Dockyard, Plymouth; W. A. MacLaren, patternmaker, East Rand Engineering Company, Limited, South Africa; C. Norbury, foreman moulder, Austral Iron Works, South Africa; J. J. Rankin, brass moulder, Austral Iron Works, South Africa; H. Rice, foreman, Mather & Platt, Limited; N. Robinson, moulder, Entwistle & Gass, Limited, Bolton; B. A. Sprong, patternmaker, Eagle Brass Foundry, Johannesburg; C. J. Swart, electric furnace foreman, Union Steel Corporation, South Africa; E. Tattersdill, foreman moulder, Newman Industries, Limited, Bristol; S. F. Watson, foreman moulder, Eagle Brass & Iron Foundry, Germiston, South Africa.

Transfers from Associate to Associate Member

G. F. Taylor, steel moulder, Head, Wrightson, Limited; J. E. Newland, patternmaker, Central Engineering Works, Limited, Johannesburg.

As Associate

A. D. Mitchell, engineering assistant, Electric Supply Commissioners, South Africa.

POST-WAR EXPORT EXPERTS

(*Concluded from previous page.*)

knowledge of the others; this situation being due, no doubt, to lack of adequate staff. The wholesale condemnation of foreigners as consuls is not always justified, for we have found some to be particularly and "peculiarly" efficient. By the second adjective we mean that they have taken justifiable risks with inept local police, which a British official would hesitate to do. There is one matter the student in the export field should be taught, and that is the dispatch of the various components of plants by different routes might show a cash saving, but this is usually lost by the waste of the erector's time at the point of receipt. Because we have different views from Mr. Roche, this does not detract from the excellence of his Paper, as neither he nor we can with certainty visualise just what shape this post-war world will take, but on one thing we do agree, and that is the urgent necessity for the immediate study of the problem in all its aspects.

REPORT ON COPPER-ANTIMONY-NICKEL GEAR ALLOY

By MEMBERS OF THE NON-FERROUS SUB-COMMITTEE OF THE TECHNICAL COMMITTEE

Submitted to the Fortieth Annual Conference of the Institute of British Foundrymen

(Continued from page 203)

THE MECHANICAL PROPERTIES OF COPPER-ANTIMONY-NICKEL GEAR BRONZES

By A. DUNLOP* (Associate Member) and FRANK HUDSON* (Member)

A number of melts have been made of nominal composition, 7 to 8 per cent. antimony, 1.5 to 2.5 per cent. nickel, balance copper, to confirm the mechanical properties claimed by the Hamilton Gear & Machine Company for the copper-antimony-nickel alloy. The effects of adding 0.5 to 1 per cent. of zinc to the nickel-containing alloy, and of substituting 0.5 to 1.0 per cent. of zinc for the 1.5 to 2.5 per cent. of nickel, have been briefly studied. Table VIII contains a summary of the results obtained on sand and chill cast samples of these alloys.

The Hamilton Gear & Machine Company claim that no advantage is obtained by chilling and state the average mechanical properties of the sand-cast alloy to be 8.5 tons per sq. in. yield point, 14.2 tons per sq. in. tensile strength, and 7.5 per cent. elongation. It will be noticed that in the sand-cast condition such values have not been attained, but by the use of chilling considerably higher values than the quoted figures can be obtained in the alloy of specified composition and when modified by the addition of a small amount of zinc. Chilling does not effect much improvement when there is no nickel present and in both sand-cast and chilled conditions the properties of the nickel-free alloy are much inferior to those obtained on the nickel-containing alloy.

The structure of the alloy is duplex, similar to that of tin bronze. Figs. 16 and 17 at magnifications of 100 and 500 respectively show the structure of a sand-cast sample containing 7.98 per cent. antimony and 1.70 per cent. nickel. The structure which has been developed by etching in a ferric chloride solution acidified with hydrochloric acid, consists of pools of a blue constituent, probably the β of the copper-antimony system in a matrix of cored α solid solution. Fig. 18 at a magnification of 100 shows a chill-cast sample of similar composition. It will be noted that chilling has resulted in the β phase being more finely divided and not forming such continuous films around the dendrites while there is less coring of the α matrix. Some porosity is evident in both samples, due, no doubt, to the very wide freezing range of the alloy.

TABLE VIII.—*Summary of Mechanical Properties of Sand and Chill Cast Alloys of Specified Composition and of Alloys Modified by the Addition of Zinc and Omission of Nickel.*

Nominal composition.	7—8 per cent. Sb, 1.5—2.5 per cent. Ni, Balance Cu.		7—8 per cent. Sb, 1.5—2.5 per cent. Ni, 0.5—1 per cent. Zn, Balance Cu.		7—8 per cent. Sb, 0.5—1 per cent. Zn, Balance Cu.	
	Sand cast (5)	Chill cast (5)	Sand cast (4)	Chill cast (3)	Sand cast (3)	Chill cast (3)
0.2 per cent. proof stress, tons per sq. in.	7.1—8.2	9.6—12.2	7.0—9.0	9.8—10.9	6.4—6.8	8.0—8.8
Yield point (0.5 per cent. elongation under load) tons per sq. in. ..	7.8—8.8	10.4—13.5	7.6—9.9	10.4—11.5	7.0—7.6	8.6—9.6
Tensile strength, tons per sq. in. ..	9.7—11.0	15.8—19.5	9.1—11.8	16.2—18.9	8.0—8.8	8.7—11.8
Elongation per cent. on $4\sqrt{\text{area}}$ ..	1—4	4—21	3—4	9—12	1—3	2—4
Izod impact, ft.-lbs.	3.5—4.5	—	—	—	—	—
Brinell hardness, 10/1,000/15 ..	63—82	73—98	72—79	81—90	65—69	71—79

Figures in brackets refer to number of bars tested.

Details of Melts

The following are the details of the various melts made: All the melting was conducted in an oil-fired crucible furnace. Remelted cathode copper and a commercial brand of antimony were used and the nickel was added either as 50/50 copper-nickel shot or 80/20 copper-nickel scrap.

For the first melt the copper and 50/50 shot were melted with the addition of an oxidising flux. The melt was deoxidised with 0.025 per cent. of phosphorus

* Research and Development Department, Mond Nickel Company Limited.

Report on Cu-Sb-Ni Gear Alloy

added as 10 per cent. phosphor copper and the antimony added. Before pouring a further addition of 0.025 per cent. of phosphorus was made. From this melt a four-bar pattern tensile bar casting, a four-bar pattern Izod bar casting and four keel block castings were poured, the casting temperature being 1,200 deg. C. The four-bar pattern tensile bar casting consisted of four cast-to-shape bars in the form of a square with feeders at each corner, the feeders being connected by two cross runners to a central downgate. The test-pieces were 6 in. long and ¾ in. diameter in the gauge length as cast. Standard 0.564-in. diameter tensile test-pieces were machined from these. The Izod bar casting was of similar design, the as-cast dimensions of the bar being ¾ in. diameter by 5 in. long. From two of these blanks standard 0.45-in. diameter notched Izod test-pieces were machined. The keel block bars were 1½ in. by 1¼ in. by 8 in. long, with a feeding block of 2½ in. square section along their full length. Two of the keel block bars were made entirely in sand, the other two had the test portion chilled with ½ in. thick steel plate. No separate runner was used for these castings, the feeding block being open and the mould filled by direct pouring.

The sand employed was not of the type normally employed for copper base casting alloys, being a synthetic sand of silica base bonded with bentonite and containing 3 to 4 per cent. of coal dust. Satisfactory results have been obtained when using this sand on a wide range of non-ferrous alloys, including tin bronzes of all types, and no trouble was expected on using this sand for the copper-antimony-nickel alloy.

The results obtained on the above castings are given in Table IX.

A second melt was made by melting risers, etc., from melt 1 with an oxidising flux and an addition of 0.05 per cent. of phosphorus made before pouring four keel block bars, two entirely in the above type of sand and two with the test portion chilled, the casting temperature being 1,180 deg. C. In this instance and in all subsequent keel block castings made the metal was introduced into the mould *via* a downgate connected to one end of the casting by an ingate leading into the test portion. All these castings were "gassed" and the feeders "spewed" badly, particularly the castings without the chills. Excess metal poured into an iron ingot mould, however, sunk well.

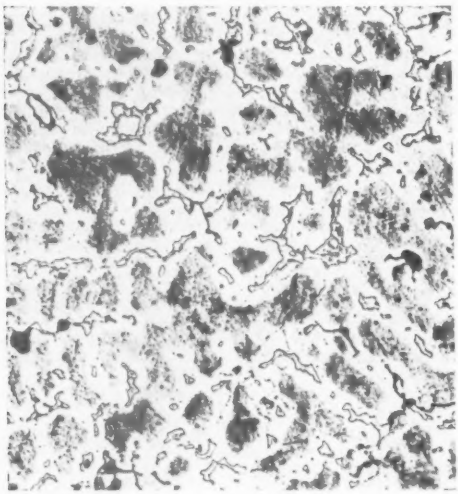


FIG. 16.—SAND-CAST SAMPLE (× 100).

FIG. 17.—SAND-CAST SAMPLE (× 500).

A third melt similar to the second melt was made and behaved similarly. Immediately after pouring all the feeders were level, but a few minutes later, the casting without chills "spewed" badly.

At this stage, it was thought that the melting technique was at fault and a fourth melt was made using new metal. The copper and cupro-nickel were melted with ¼ per cent. of copper oxide and 1 per cent. of manganese ore and deoxidised with 0.05 per cent. of phosphorus, the antimony was added followed by 0.5 per cent. of zinc. Four keel block castings, two with and two without chills, were poured at a temperature

of 1,180 deg. C. All the castings were "gassed" and the castings without the chills "spewed" badly.

A fifth melt was made using the risers from melt 4. No flux was used, and the furnace burner was set to give oxidising conditions. On melting, some bubbling was noted. The oil was turned off and the melt allowed to cool slowly in the furnace until pasty. At this stage bubbling had ceased and the melt was quickly raised to 1,100 deg. C. and four keel block bars poured, two with chills and two without. The castings with chills sunk slightly, the others rose. On cutting off the test portions, the castings with the chills were sound while the others had many gas holes just below the skin (see Fig. 19, which illustrates the unsoundness).

TABLE IX.—*Mechanical Properties of Alloy of Composition* 89.45 *per cent. Copper,* 8.03 *per cent. Antimony,* 2.42 *per cent. Nickel.*

Type of tensile casting.	0.2 per cent. proof stress. Tons per sq. in.	Yield point (0.5 per cent. elongation under load). Tons per sq. in.	Tensile strength. Tons per sq. in.	Elongation, per cent. on $4\sqrt{}$ area.	Brinell hardness, 10/1,000/15.	Izod impact. Ft.-lbs.
Sand cast to shape ..	7.6†	8.1	11.0	4	—	4.0 3.5 } 4.0 4.5
Sand cast to shape ..	8.2	8.8	9.7	2	63	4.5 4.5 } 4.5
Sand cast to shape ..	8.0	8.8	10.1	2	—	4.0
Keel block bar sand cast	7.1	7.8	10.0 6.4*	3 2	—	—
Keel block bar with test portion chilled ..	12.2‡ 11.4	13.5 12.0	17.9 13.6*	4 2	— 98	—

* Flaw in fracture. † Density 8.04. ‡ Density 8.76.

TABLE X.—*Effect of Casting Temperature and Modifications to the Composition on the Mechanical Properties of the Copper-Antimony-Nickel Alloy.*

Nominal composition.	Casting temperature. ° C.	Mould.†	0.2 per cent. proof stress. Tons per sq. in.	Yield point (0.5 per cent. elongation under load). Tons per sq. in.	Tensile strength. Tons per sq. in.	Elongation, per cent. on $4\sqrt{}$ area.	Brinell hardness, 10/1,000/15.
Antimony, 7—8 per cent. ..	1,180	Chill ..	8.8	9.5	13.3*	6	81
Nickel, 1.5—2 per cent. ..	1,150	„ ..	9.8	10.4	15.8	7	82
Cu, balance ..	1,180	Sand ..	6.4	6.9	7.2*	3	75
	1,080	„ ..	8.0	8.7	9.8	1	82
	1,180	Chill ..	9.8	10.4	16.2	9	81
Antimony, 7—8 per cent. ..	1,110	„ ..	10.9	11.5	18.9	10	90
Nickel, 1.5—2 per cent. ..	1,000	„ ..	9.8	11.0	18.2	12	84
Zinc, 0.5—1 per cent. ..	1,180	Sand ..	7.0	7.6	9.1	4	73
Cu, balance ..	1,110	„ ..	8.4	9.1	10.9	3	77
	1,100	„ ..	7.6	8.3	10.9	4	72
	1,000	„ ..	9.0	9.9	11.8	3	79
Antimony, 7—8 per cent. ..	1,190	Chill ..	8.0	8.6	8.7	3	71
Zinc, 0.5—1 per cent. ..	1,100	„ ..	8.8	9.6	10.4	2	77
Cu, balance ..	1,100	„ ..	8.8	9.5	11.8	4	79
	1,190	Sand ..	6.4	7.0	8.0	2	65
	1,100	„ ..	6.8	7.6	8.8	3	69
	1,070	„ ..	6.4	7.2	8.1	1	68

* Flaw in fracture. † All castings of the keel block type.

Report on Cu-Sb-Ni Gear Alloy

Properties of Chilled Bar

The following properties were obtained from the chilled bar from this melt:—

Analysis.—Copper, 91.3 per cent.; antimony, 7.4 per cent.; nickel, 1.27 per cent.

0.2 per cent. proof stress, tons per sq. in.	9.6	9.6
Yield point (0.5 per cent. elongation under load) tons per sq. in.	10.2	10.1
Tensile strength, tons per sq. in. ..	19.5	18.6
Elongation per cent. on $4\sqrt{}$ area ..	21	14
Brinell hardness (10/1,000/15) ..	73	

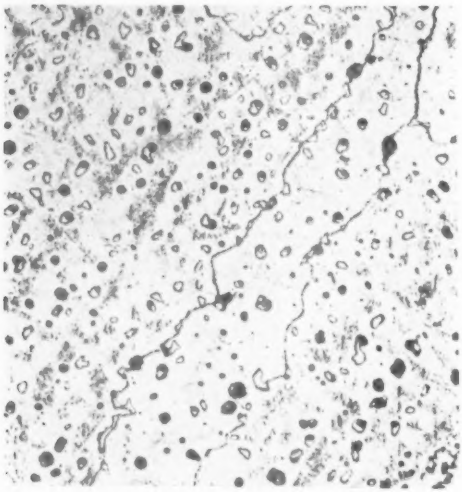


FIG. 18.—CHILL-CAST SAMPLE (× 100).

FIGS. 16-18.—MICROSTRUCTURE OF SAND- AND CHILL-CAST SAMPLES CONTAINING 7.98 PER CENT. SB AND 1.70 PER CENT. NI.

In all of the above melts it was noted that no matter how badly a casting "spewed" excess metal poured into a cast iron ingot mould invariably sunk. This seemed to indicate that the gassing trouble might be due to the presence of coal dust in the sand. The subsequent melts were made in sand free from coal dust, and no further trouble due to "spewed" castings was encountered.

A number of melts were made using sand free from coal dust to produce keel block castings with and without chills. In all cases no flux was used, the oil burner of the furnace being set to give slightly oxidising conditions. The effects of varying the casting temperature, adding a small amount of zinc and dispensing with the addition of nickel were studied, the details of the results obtained being given in Table X. It will be noted that generally the lower the casting temperature the higher the hardness and other mechanical properties. The addition of a small amount of zinc confers a slight improvement in properties, while the properties of the nickel free alloy are much inferior to those obtained on the nickel containing alloy.

In the sand cast condition the results are somewhat inferior to those claimed by the Hamilton Gear & Machine Company. Further work is required with a view to removing porosity in comparatively thick sand cast sections arising from the wide freezing range of approximately 400 deg. C. Also the tendency for the hard β phase on slow solidification to form rather continuous films around the dendrites is a factor contributing to the low strength values obtained in the comparatively heavy section of the keel block castings made entirely in sand.

The results show the advantages likely to be obtained by the use of chills on castings of heavy section.

THE ANALYSIS OF COPPER ALLOYS CONTAINING ANTIMONY AND NICKEL

BY R. WOOLLEN* (Associate Member)

In alloys of this type, where the copper may be the preponderating element, the well-known sulphide method is not satisfactory. However, a number of methods have been worked out which can be satisfactorily applied in these circumstances. Evans ("Analyst," 54, 395) has shown that antimony can be precipitated in the presence of copper by means of sodium hydrosulphite and Lassieur and Torrance ("Analyst," 62, 719) have shown that copper can be deposited from solutions containing antimonic fluoride ions. In addition to these methods, copper and antimony may be deposited together from chloride solutions using controlled cathode potential (Torrance, "Analyst," 62, 719), and subsequently separated as above. The choice of method used will depend upon the individual and availability of suitable apparatus.

Antimony

Weigh 1 grm. into 400 mls. tall beaker. Dissolve in a mixture of 15 mls. hydrochloric acid, 5 mls. nitric acid, and 20 mls. water. Add 10 grms. of citric acid (20 mls. of a 50 per cent. solution), and make the solution faintly alkaline with ammonia. Treat a saturated solution of potassium cyanide with bromine water until a drop removed gives no violet colour with sodium nitroprusside. Add this solution to the ammoniacal solution of the sample until the blue colour is just discharged, add 20 mls. in excess, followed by 50 mls. of a 20 per cent. solution of ammonium chloride and 7 grms. of sodium hydrosulphite. Heat to boiling and allow to stand on steam bath for 1 hr., add 2 grms. more hydrosulphite and place in running

* Messrs. Henry Wiggin & Company, Limited.

water to cool. Stir in a little paper pulp. Filter through a pulp filter and wash with a cold solution of 20 mls. saturated potassium cyanide, 4 grms. ammonium chloride, and 2 grms. sodium hydrosulphite in 400 mls. water. The filtration and washing should be carried out as quickly as possible to avoid oxidation and resolution of antimony. Boil the filtrate, ignore the presence of sulphur, but if it is blackened by the presence of antimony add more hydrosulphite, boil, cool and filter as before.

Transfer the filter back to original beaker. Cover with 1:1 hydrochloric acid containing bromine. Stir up the pulp and when the antimony is dissolved strain off the pulp, washing with 1:1 hydrochloric acid into a 400-ml. tall beaker. Add sulphurous acid a few mls. in excess of that required to discharge the bromine colour, and evaporate the solution down to 10 mls. (approx.). Add 10 mls. conc. hydrochloric acid, 100 mls. water, and heat to boiling. Add 2 or 3 drops of methyl orange (0.1 per cent.) and titrate at not less than 80 deg. C. with standard potassium bromate until the indicator colour is discharged. Considerable differences in the result occur according to the time of addition of the indicator. It is desirable to delay the addition until the last possible moment, say about 1 ml. from the known end point. Unless the antimony content is known the determination should be duplicated in order that this procedure may be adopted. (Potassium bromate, 2.782 grms. per litre. 1 ml. = 0.006088 grms. antimony.)

Copper

Dissolve 0.5 grm. in a mixture of 5 mls. conc. nitric acid, 5 mls. hydrofluoric acid and 10 mls. water. Boil off the oxides of nitrogen, dilute to 150 mls. Add a solution of potassium dichromate dropwise until the liquid is distinctly yellow and electrolyse at room temperature at 1 to 2 amps. for 1 hour.

If any considerable number of these determinations are required the beakers used should be segregated and retained for this purpose as they become perforated after a time.

Nickel

Dissolve 1 grm. in dilute nitric acid. Dilute to 150 mls., add several grms. tartaric acid, and make faintly alkaline with ammonia. Heat to 70 deg. C., and add an excess of dimethylglyoxime reagent. Filter and wash with hot water. Dissolve the precipitate back into the original beaker with hot dilute hydrochloric. Make alkaline and precipitate as before. Filter, wash and determine either by drying and weighing as complex or igniting and weighing as nickel oxide.

Copper and Antimony by Electrolysis

For the apparatus necessary and fuller details of these determinations, reference should be made to "Electrochemistry and Electrochemical Analysis," Vol. 11, by H. J. S. Sand. Dissolve 0.4 grm. in 400 mls. tall beaker by adding 10 mls. conc. hydrochloric acid, 10 mls. water and 2 or 3 *drops* conc. nitric acid. Torrance dissolves white metals in hydrochloric acid and potassium chlorate but the high copper alloys take overnight to dissolve in this way. The substitution of a small amount of nitric acid gives rapid solution and has not been observed to cause any trouble.

When the alloy is dissolved add 5 mls. conc. hydrochloric acid, dilute to 150 mls. and add 1 grm. hydrazine hydrochloride. The liquid is electrolysed with Fischer's electrodes at a P.D. saturated calomel electrode-cathode of 0.4 volt and at a temperature of 70 deg. C. Copper and antimony are deposited together and 30 minutes are required to remove the last trace of antimony. The electrolyte may be preserved for nickel, zinc, etc.

Dry and weigh the copper plus antimony deposit.

Dissolve the deposit from the electrode in a mixture of 5 mls. conc. nitric acid, 5 mls. hydrofluoric acid, and 10 mls. water. After boiling off the oxides of nitrogen, dilute, and after adding potassium dichromate until the solution is yellow, deposit the copper at room temperature with a current of 1 amp. for 1 hour. Dry and weigh the deposit.

The weight of antimony is obtained by difference.

Antimony results obtained by the two methods are given below:—

Sample No.	A.	B.	C.
	Per cent.	Per cent.	Per cent.
Electrolytic	8.30	7.15	7.98
Hydrosulphite	8.25	7.12	8.09

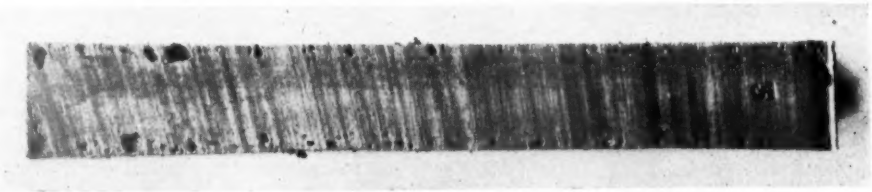


FIG. 19.—GAS UNSOUNDNESS IN SAMPLE OF CU-SB-NI ALLOY CAST IN SAND CONTAINING COAL DUST (APPROX. ⅔).

(*Concluded on page* 218.)

REPORT ON COPPER-ANTIMONY-NICKEL GEAR ALLOY

(*Concluded from page* 217.)

ESTIMATION OF ANTIMONY IN 90-8-2 COPPER-ANTIMONY-NICKEL ALLOYS

By James McPheat* (Associate Member)

To 1 grm. of sample add 0.2 grm. tin (C.P.) and dissolve in 25 mls. dilute nitric acid (1:1). When completely dissolved boil down to 10 mls. bulk and add 100 mls. boiling water. Allow to settle for half an hour, keeping the temperature just below boiling point. Filter in a small close filter pad and wash with boiling water. Discard filtrate.

Transfer the pulp and residue to a 350-mls. conical flask and add 15 mls. nitric acid (conc.), 5 grms. ammonium persulphate and 15 mls. sulphuric acid (conc.). Boil down to strong fumes of SO_3. If the solution is brown, repeat, using 10 mls. nitric acid (conc.) and 2 grms. ammonium persulphate.

When colourless, cool, add 100 mls. water, 20 mls. hydrochloric acid (conc.) and 3 grms. sodium sulphite. *Boil until absolutely free from* SO_2 (approximately ten minutes). Dilute to 200 mls. with water and cool to 10 to 15 deg. C. on ice. Titrate with potassium permanganate (standard solution), until a permanent pink.

Standard Potassium Permanganate.—2 grms. potassium permanganate per litre. Standardise against pure sodium oxalate or alternatively against pure antimony. 1 ml. potassium permanganate = 0.002 grm. antimony.

Notes

1.—In alloys containing an excess of tin, the antimony is precipitated quantitatively with the meta-stannic acid.

2.—If the solution becomes cool during the first filtration, some of the meta-stannic acid may dissolve.

3.—Ammonium persulphate and nitric acid are used to destroy the filter paper and to dissolve the tin plus antimony.

4.—If arsenic is present, correction must be made for the arsenic content.

This method for the determination of antimony is simple and accurate and does not call for a highly skilled operator. Copper and nickel can be estimated by the usual methods. The effect of other elements has been checked and the process has been tested out by three operators who had not tried it before. Very satisfactory results were obtained.

(*Concluded from next column.*)

tion of overtime, nightshift allowances and holiday credits.

The adjustment (increase of 1s. per week of 47 hours and the increased figures on which overtime payments, etc., have to be calculated) necessitated by this decision of the Arbitration Tribunal is retrospective in effect from the beginning of the first full pay period following March 20, 1943.

* Messrs. G. & J. Weir & Company, Limited.

PRODUCTION AUTHORITIES GUIDE

The Ministry of Production has just produced a guide which shows at a glance which is the authority responsible for the production of manufactured products that are not obviously the concern of a single Government department. Neither industry nor departments have any difficulty in knowing, for instance, that tanks are the responsibility of the Ministry of Supply and aero engines of the Ministry of Aircraft Production. But between such well-defined classes of munitions is a vast number of products which, because they are used in a great variety of finished articles or for many different purposes, are common to more than one department.

These common products include, for instance, agricultural machinery, anti-gas equipment, benzole, bicycles, ball bearings, bolts, nuts and screws, cement, clothing and footwear, locomotives, pencils and tyres. To ensure the orderly planning of the production and allocation of these common products, Production Authorities have been established. Their objectives are to assess requirements and see that capacity is there to meet them.

This guide, called "The Production Authorities Guide," contains a list of 194 products, the Production Authorities responsible for each, and other details such as whether the control is exercised by Order or whether there is an Advisory Trade Panel. It has been printed for the Ministry of Production by the Stationery Office, price 4d. It deals only with manufactured products. Raw materials are dealt with in the "Raw Materials Guide," issued by the Ministry of Supply and also published by the Stationery Office, price 1s. 1s. 2d. post free.

PATTERNMAKERS' WAGES

Patternmakers are to receive the full 6s. a week increase embodied in the award of March 20 last on the engineering wages claim. The engineering employers took the view, having regard to the existing national agreement between the Engineering and Allied Employers' National Federation and the United Patternmakers' Association, that patternmakers should continue to receive 25 per cent. of the appropriate district rate for patternmakers, less the 5s. differential, plus the pieceworkers' national bonus in terms of the award. This adjustment by the consolidation of 20s. in the basic rate meant in effect that patternmakers benefited by the award to the extent of 5s. per week. The patternmakers claimed that they were entitled to the full 6s. awarded to plain time workers, and the question was submitted to the National Arbitration Tribunal for interpretation.

The Tribunal decided that the total weekly rate, however it may be made up, to which a timeworking patternmaker is entitled under the award is a rate which is 6s. per week in advance of the total weekly rate, which was payable to the worker immediately prior to the date of operation of the award, and such sum of 6s. is to be taken into account in the computa-

(*Concluded in previous column.*)

CAST BRASSES A AND B (B.S.S. 1025-1028)

SUBSTITUTES FOR GUNMETAL

Joint Report by The Institute of British Foundrymen, The Association of Bronze and Brass Founders and the British Non-Ferrous Metals Research Association

Introduction

B.S. specifications for the cast brasses A and B were issued in the War Emergency B.S. specification 1021-1028: Copper Alloy Ingots for Casting, with a view to extending the use of these alloys for castings formerly made in gunmetal. The relevant specifications are given in Table I.

TABLE I.—*Cast Brasses A and B.*

	B.S.S. 1025–26.	B.S.S. 1027–28.
Composition, per cent.—		
Copper	70—80	62—70
Tin	0—2	0—2
Lead	1—4	1—4
Nickel	0—1	0—1
Iron	0—0.75	0—0.75
Aluminium	<0.01	0—0.25
Manganese	—	0—0.25
Zinc	Remainder	Remainder
Mechanical Properties—		
U.T.S., tons per sq. in. ..	11	14
Elongation per cent. on $4\sqrt{A}$	20	12

The Non-Ferrous Metals Control expressed their concern to the Institute of British Foundrymen, the Association of Bronze and Brass Founders and the British Non-Ferrous Metals Research Association at the limited use of these materials and requested that an investigation be made to determine whether there were serious difficulties encountered in practice and to determine whether any modifications of the specifications were necessary or desirable. The Non-Ferrous Sub-Committee of the I.B.F. and the technical committee of the A.B.B.F. have accordingly issued questionnaires to their members and the B.N.F.M.R.A. has carried out a limited amount of experimental work. The results of these investigations are given in the following joint report.

REPLIES TO QUESTIONNAIRES

A summary of the questions and replies received is as follows:—

Types of Castings Made

The brasses are being used widely for small parts, such as bushings, taps, sanitary fittings, casings, brackets, nameplates, etc., most of which are evidently virtually unstressed castings and many of which do not require to be pressure tight. A considerable amount of pressure castings are being made, such as valve bodies, cocks, etc., subject to pressures up to 350 lbs. per sq. in. The sectional thickness of these castings ranges from about ¼ in. to a maximum of 2 in. at bosses and flanges, etc., but the average section is generally of the order of ¼ to ½ in. One user is making castings up to 500 lbs. in weight, but on the whole the brasses are used for small light section castings.

Mechanical Properties of Test-Bars

Test-bar castings commonly used are:—(*a*) The standard I.B.F. bar; (*b*) similar bars made in pairs and gated at both ends; and (*c*) keel bar castings as for manganese bronze. In many cases no mechanical tests are called for, but, where they are required, no difficulty is experienced in meeting the specification figures. For example, values quoted for brasses to B.S.S. 1026 with compositions of the order of Cu 70-80 per cent., Sn 0.1-0.7 per cent., Pb 1.5-4.0 per cent., Fe 0.1-0.7 per cent., Ni 0.1-0.5 per cent., and Al nil, generally range from 11 to 15 tons per sq. in. tensile strength and 20 to 40 per cent. elongation.

For brasses to B.S.S. 1028, with composition of the order of Cu 63-67 per cent., Sn 0.3-1.2 per cent., Pb 2-3 per cent., Fe 0.1-0.3 per cent., Ni 0.0-0.1 per cent., and Al nil-0.03 per cent., values of 13 to 16 tons per sq. in. tensile strength and 15 to 25 per cent. elongation are quoted. Pouring temperatures vary widely, ranging from 960 to 1,180 deg. C., the higher temperatures being used for alloys of high copper content, but one series of results quoted indicate that low pouring temperatures, *e.g.*, 960 to 1,000 deg. C. give the best results.

Casting Properties

In general pattern equipment, etc., previously used for gunmetal castings has been satisfactorily used for the brass castings, but where changes have been necessary they have generally been to (*a*) freer venting, including the use of more permeable sand, (*b*) the use of larger downgates and runners and faster pouring, and (*c*) more generous feeders, particularly for pressure-tight castings.

Both green and dry sand are used, and there appears to be no difficulty in running thin sections. Generally no tendency to hot cracking is noted, but some users refer to a tendency to crack, which can be avoided by more generous feeding. Pressure-tight castings in B.S.S. 1026 can generally be obtained without change in the technique from that used for gunmetal, but in some cases more generous feeding has been necessary. In one example cited 95 per cent. pressure-tight castings were being made in 95/5/5/5, but on turning to B.S.S. 1026, 50 per cent. of the castings leaked. Pressure castings are generally only made in B.S.S. 1026, and some users express a preference for a copper content near to the upper limit of the specification.

One foundry reports failure to make large pressure-tight castings in Brass A owing to centre line shrinkage associated with a coarse columnar structure. When the castings were drilled at various points, leakage occurred from one hole to another through the cavities at the centre of the section. Increasing the iron

content above 0.7 per cent. caused grain refinement, but dispersed porosity then appeared, causing leakage at local parts of the casting.

In several cases the objectionable zinc fume is mentioned, particularly with reference to black-out conditions and the resultant bad ventilation in foundries. One user expresses a preference for the presence of 0.02 to 0.05 per cent. aluminium to minimise the zinc fume, but the remainder are unanimous in condemning aluminium as a very harmful constituent, particularly when castings are required to withstand pressure. It is stated that the presence of aluminium causes serious drawing and cracking.

Experimental Work by the B.N.F.M.R.A.

A considerable amount of work has been done on gunmetal castings, with particular reference to their tensile strength and pressure tightness in the B.N.F.M.R.A.'s research on the casting of bronzes. Several samples of brasses A and B were obtained from ingot manufacturers and test-bars and castings for pressure tests previously used for experiments with gunmetals were made in these brasses. In addition the compositions of some of the brasses were modified by various additions and further test castings were made. The results obtained may be briefly summarised as follows:—

Mechanical Properties

The materials as received generally gave figures in excess of the specification values, but some alloys of modified composition which nevertheless conform to B.S.S. 1028 had poor mechanical properties. Some of the test results are given in Table II.

The brasses to B.S.S. 1026 had satisfactory properties and similar good results were obtained from alloys whose copper and tin contents were raised to the upper limits of the specification. Additions of aluminium (0.04 to 0.5 per cent.) to the alloys of high copper content seriously impaired their mechanical properties. Raising the iron content to 0.8 per cent. did not cause grain refinement, but increased the strength slightly and lowered the elongation.

The brasses to B.S.S. 1028 also had satisfactory properties except where the tin content was up to the limit of the specification, and particularly when the copper content was at the lower limit. The alloys of high tin content had duplex structures, with large amounts of the hard constituent where the copper content was low. Some tests were also made on a low-grade bronze containing 80 per cent. copper, 2.9 per cent. tin, 6.6 per cent. lead, 0.2 per cent. iron, remainder zinc. Consistent test results averaged 12.5 tons per sq. in. and 19 per cent. elongation.

Casting Properties

A test casting consisting of a 5 in. dia. disc $\frac{1}{2}$ in. thick, with bosses on either side at the centre, $\frac{1}{4}$ in. in diameter and $\frac{1}{4}$ in. high, was used, the same casting having been previously used for tests on gunmetals. The casting is run at the boss through a restricted ingate and feeding is very inadequate. Gunmetal castings very rarely show any external drawing or cracking at the root of the bosses and the castings are about 95 per cent. pressure tight as cast and about 80 per cent. pressure tight after machining $\frac{1}{16}$ in. from all surfaces.

The brasses obtained from secondary metal manufacturers had copper contents of the order of 70 to 76 per cent. for B.S.S. 1025, and 64 to 67 per cent for B.S.S. 1027. Discs in these brasses showed marked drawing and cracking at the root of the bosses and they leaked as cast. Discs made in B.S.S. 1025 with a high copper content (80 per cent.) and in the low-grade bronze mentioned above, were free from drawing and cracking and were generally pressure tight as cast. About 80 per cent. of these castings leaked after machining.

(*Concluded on page* 224.)

TABLE II.—*Test Results.*

	B.S.S. 1026.					B.S.S. 1028.				
	Composition, per cent.					Composition, per cent.				
	As received.		Modified.*			As received.			Modified.*	
Copper	69.9	76.3	78.7	80.4	80.0	64.0	64.2	67.6	62.1	63.2
Tin	0.8	2.2	1.9	1.9	2.0	1.0	0.9	2.0	1.9	1.9
Lead	2.7	1.9	2.4	2.1	2.1	2.4	2.2	4.6	2.6	2.6
Nickel	0.01	0.2	0.4	0.2	0.3	0.2	0.1	0.1	0.3	0.3
Iron	0.2	0.3	0.2	0.8	0.3	0.4	0.5	0.2	1.0	1.0
Aluminium	<0.01	<0.02	<0.01	<0.01	0.04 to 0.5	<0.18	<0.02	<0.01	<0.01	<0.01
	Mechanical properties.									
U.T.S. tons per sq. in. ..	12.4	11.8	13.7	15.4	9	14.5	15.3	10.3	18.3	17.8
Elongation per cent. $4\sqrt{A}$	39	20	34	16	12	32	19	16	7	7

* Prepared from secondary brasses supplied by additions of copper on zinc, etc.

A WARTIME STEEL FOUNDRY—SOME PROBLEMS AND DEVELOPMENTS

By E. D. WELLS (Member) and A. JOHNSON (Associate Member)

Presented at the Annual Conference of the Institute of British Foundrymen on June 26

(Continued from p. 204)

Use of Whirl Gate

In the authors' foundry, the whirl gate is used to advantage on a large number of jobs, a few examples which may prove of interest to steel founders are illustrated on the next page.

Figs. 1 and 2 show a simple crankshaft and one slightly more complicated. The thickening up pieces shown in the sketch were added to avoid any restrictions of feeding to the heavier sections beyond. These castings, although made in sand mainly composed of silica sand, reclaimed sand and Fulbond, obviously must be sand-free. This has been largely achieved by the cleansing action of the whirl gate head, and a large number of both types of castings has been produced sound and without blemish.

Fig. 3 is a good example of the better positioning of heads which is possible under the new method. This casting would usually be made with a head on the boss and one on the flange, with a resultant cavity at "A" unless the second head were heeled over the side. With one head feeding two castings—positioned as shown in the sketch—these brackets are being more perfectly sound. The bracket shown in Fig. 4 would have been difficult to make sound by any other method. If the pattern had been altered and cast with the boss A at the top, with the runner placed at the bottom for easy running, boss B would have had the hottest metal and shown a cavity. With the old type of heel head on the side, the ingate would assuredly have been made bigger than the boss with a subsequent excessive amount of cutting off.

Fig. 5 shows four bevel pinions cast off one large head. A saving in steel and ease in pouring are claimed in this case. The burning off of the head is less than is usually needed, but it is believed that this can be saved still further. Experiments are in hand casting the pinions the other way up and the ingate merely on the surface A. The height of head will only be the same despite the fact that the ingate is much lower than the top of the casting.

Sand

It has always been a difficult proposition in most foundries to dispose of used sand. This is now more of a problem than ever before. Labour for the removal of sand is almost impossible to procure and a fleet of lorries is very difficult to maintain. On the other hand, supplies of new sand have become erratic and unreliable for the usual large quantities. Therefore it has been borne upon many foundries to utilise more of the used sand. This has certainly been the trend for a number of years, but the war has given an added impetus to this development. Different types of sand reclamation plants are in use all over the country, but there is still much to be done in this respect. Without adequate means of removing the silt, a moulding sand based on a high percentage of used sand tends to become very friable, and when dried at only medium temperatures for any length of time, cracks and spalls rather badly. To get good consistent results from old sand, it is better merely to reclaim the grains of silica sand and remove the fines and burnt clay. Any fusible elements and fines which are needed in the milled sand can be re-introduced by the addition of a percentage of good naturally-bonded moulding sand.

Ordinary reclaimed sand from a jobbing foundry where different grades of sand have to be used is bound to be erratic in its qualities. Strict supervision is necessary on the moulding sand as produced from the mills. Any substantial increase in green strength which is usually accompanied by a lower permeability must be counteracted at once—usually by an addition of free silica sand.

Supplies of bentonite have been short, necessitating much investigation into the different types of clays available as a substitute. Several have been tried, but most are far inferior in green strength, and the sand tends to crack when used for deep mould faces. The best substitute so far used in the authors' foundry is Fulbond in its various grades, generally fully supporting the findings of the moulding materials sub-committee of the Iron and Steel Institute. Fulbond is still, however, much inferior to bentonite in bond and resistance to erosion. A larger quantity has to be used to obtain the same green strength. This means a lower permeability at once, and through time, greatly affects the reclaimed sand. This becomes far less permeable without possessing a greater green strength and, consequently, a much less percentage of reclaimed sand can be used—the opposite effect to that which is sought.

The Fulbond mixtures do not stand up to the metal as well as those made from the stronger clay. In fairly heavy sections there is a tendency for the sand to burn on to the casting, and even with medium work if the runner of necessity has a scoring effect the sand fails completely to stand up to the test. In some cases, when scabbing or erosion has occurred, it has been found necessary either to go back to the use of bentonite—which has completely cured the faults—or to take special precautions with nailing, etc.

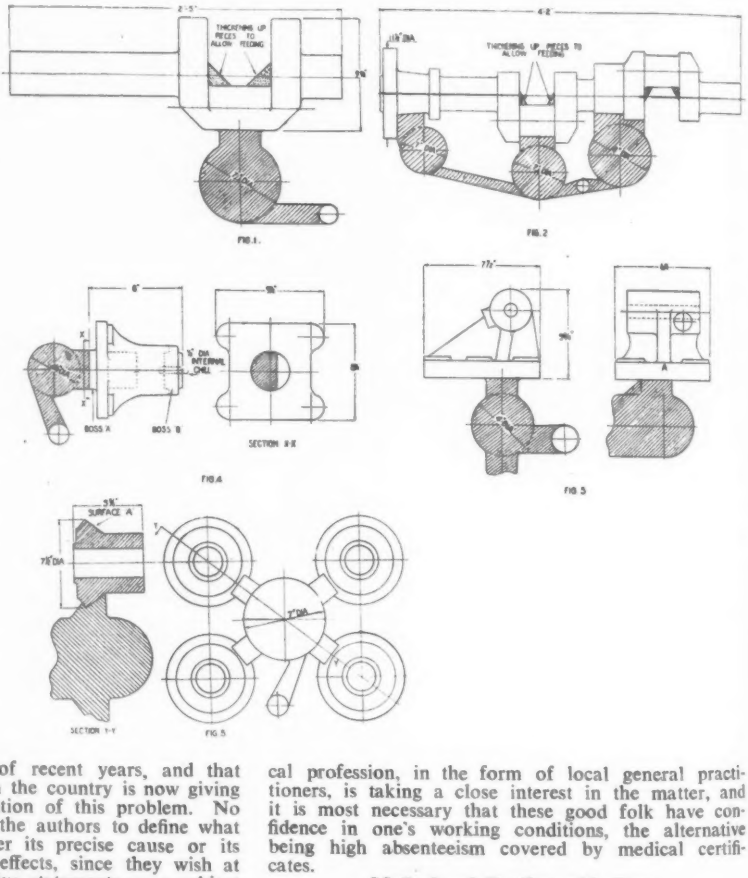
An interesting development in recent years has been

A Wartime Steel Foundry

to discard clays entirely and use more organic substances such as the various proprietary core compounds. This has been sufficient to cure scabbing and erosion on some really bad cases, even when using it for shop-dried green-sand cores. After casting, of course, the sand is much easier to knock out when using these core compounds, and this alone has been sufficient to bring about a great saving in labour, apart from the benefits derived from the better castings.

Dust Problems

Although many problems existed before the war arising from the presence in the foundry of a dusty atmosphere and from the necessity for grinding surfaces of castings on which sand was present, it is only true to say that most, if not all, of the manifestations of this trouble have become of a more serious nature during the war. The reasons for this are many, the chief ones being:—(*a*) Poorer ventilation due to the "blacking-out" of shops; (*b*) more operatives in a given area; (*c*) longer hours of work; and (*d*) in some cases enforced change of foundry materials has tended towards a rougher casting requiring more grinding.



The authors feel that theirs is not the only foundry where the dust problem has been attracting some attention of recent years, and that practically every foundry in the country is now giving serious thought to the solution of this problem. No attempt is being made by the authors to define what is meant by silicosis, either its precise cause or its development and physical effects, since they wish at all costs to avoid provocative statements on a subject which is primarily one for medical research.

The author's concern is simply that the presence in the atmosphere of any dust of a siliceous nature is a potential source of danger to workpeople, the effects leading to anything from mild laryngitis to the last stage of silicosis. Remove the root cause of this dusty atmosphere and it will be possible to deal with the whole range of forms of such illness at once, and it is towards the complete solution of this problem that founders must concentrate. In recent years the Home Office have taken a very much greater interest in this dust problem, and it is most likely that before long there will be new legislation governing working conditions in the foundries. This apart, the medical profession, in the form of local general practitioners, is taking a close interest in the matter, and it is most necessary that these good folk have confidence in one's working conditions, the alternative being high absenteeism covered by medical certificates.

Methods of Dealing with Dust

The five most common methods to-day of dealing with the dust menace are:—(1) Provision at specific points where dust is caused of hoods connected by pipes to cyclones, the dust being collected in bag filters or similar arrangements; (2) the wearing of

respirators by the workpeople; (3) the employment of a company's doctor to ensure that men with a medical history embracing lung or throat troubles are not started on a dust-risk job and to make periodical examinations of men who are engaged on such operations to make sure that their health is not being impaired; (4) elementary devices such as watering the floor, etc.; and (5) forms of roof ventilation either by fans, or by means of a purely static system.

The first four of the above methods are each in its own way admirable, and a thorough combination of all goes a long way towards the complete solution desired. They are all to be seen in various foundries to a greater or lesser degree, and there is little doubt that an intensification of such methods will lead to further improvements.

The fifth method mentioned is, in the authors' opinion, not a highly effective one when viewed from the point of dust extraction. Such arrangements can be very satisfactory for removing hot air, fumes, smoke, etc., but do not achieve a really first-class result with actual dust, since, by the time it has been drawn to the roof, everybody has had an opportunity of inhaling dust particles.

A few comments on the other points tabulated are perhaps not out of place. With regard to dust extraction devices of the cyclone type, these are of many sorts and sizes, and are, generally speaking, effective. In many cases there is a tendency for the designers to under-estimate what is required of them, with the result that they deal with, say, 80 per cent. of the dust at a given place and allow the remainder to escape. This type of plant is also somewhat troublesome when it comes to disposal of the dust collected in the bags, and it is likely in this connection "sludge" methods of collection and disposal will one day supersede the bucket method. Referring to the question of respirators, there are nowadays to be had very effective designs, and improvements in comfort to the wearer have resulted in recent years. Nevertheless, difficulty is sometimes met in persuading men to wear such devices, a claim being made that they make breathing difficult when great muscular effort is called for.

It is a practice in some foundries, and is to be highly recommended, to issue each man with a freshly cleaned and disinfected respirator before each shift. The respirators are kept in a room devoted solely to the purpose, and a man is employed to carry out the cleaning, storing in bags and re-issue at the start of each new shift. Such an arrangement has been found in practice to be a real encouragement to men to wear these respirators. A similar idea has been adopted for shot-blast operators, each man having two helmets which are scrubbed and disinfected on alternate shifts.

Referring to the works' medical officer, his position is a very difficult one. He is in the company's employment and may, because of that, become the object of some suspicion by workpeople and local doctors alike. He will also occasionally run counter to the views and wishes of the production staff, who may regard his proposals as a brake on production. He must be what may be termed an "industrial psychologist," and he must understand workshop practices and customs, together with all the forms of malingering and grousing to which human nature is sometimes a prey. He is, however, a very necessary institution and any differences of opinion between production folk and the medical adviser must remain in the realms of healthy controversy, with a real understanding on each side for the other's difficulties.

Some Likely Future Developments

Arising now from this last section and from the short section on sand practice, the authors wish to comment briefly on two developments which, in their opinion, are likely to go hand in hand. These are:—(1) The increased adoption of synthetic sand practice, with particular reference to the use of the single sand process; (2) the hydro-blasting of castings.

These two subjects are allied for the following reasons:—First, the hydro-blast, in addition to cleaning castings, also reclaims and reconditions a big proportion of sand, and, secondly, both practices tend to lead to the elimination of dust at some of its main sources and, therefore, in many cases become of more importance than the five methods of elimination of dust dealt with in the previous section.

By the single sand process the authors mean a system in which "backing sand" is eliminated, one sand only being used for the mould part. This, in a sense, sounds an extravagant use of sand, but so is the practice still common to-day, with the use of separate facing and backing sands, of disposing to dumps of hundreds of tons of used sand every week. The space taken up by this sand, the danger to health caused by its presence (in the dry state) in the shop, the cost of its removal and replacement by hundreds of tons of new sand brought from a distance, is no light matter.

Sand plant design has improved greatly in recent years as experience has been gained on the reclamation and reconditioning of used sand. The ultimate solution is by no means yet attained, but sufficient progress has been made to convince the authors that the final goal will be reached in which used sand can really efficiently be sorted and separated, the largest proportion being first-class material for re-use.

Single sand practice is to-day being used in many shops. In some it has been tried and for very good reasons given up, the good reasons being that the quality of the castings has sometimes suffered. In the authors' opinion the fact does not condemn the process—it merely demonstrates that it is still in a partially developed state.

The day will come, probably quite soon, when we can control our sand practice as definitely as we control our steelmaking process. The single sand process is still probably of "the shape of things to come," but it represents, in the authors' opinion, the definite direction in which progress will be made, eliminating, as it does, the variation in returned sand which must exist where the practice is to use facing and backing sands of different quality. Great improvements will result from intensely accurate sand control on these lines—better castings and less dust risk. Furthermore, better

(*Concluded on page* 224.)

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(*Concluded from page* 223.)

castings in the sense of cleaner castings will lead to less dust risk in the fettling shop by a reduction in the amount of necessary grinding.

Hydroblasting of Castings

Turning now briefly to the hydroblast, it is probably common knowledge that experimental plants are being built for different parts of the whole foundry industry, ferrous and non-ferrous. Although hydroblast in a multiplicity of forms has been worked in the United States for many years, it has in every case been designed for a specific purpose. There is therefore no particular design suitable for general adoption in the jobbing foundries of this country, and consequently the usual teething troubles are likely to be experienced when the plants are installed.

Great credit is due to the works who are to experience these troubles, for their trials and tribulations are likely to prove of inestimable benefit to the foundry industry as a whole. Great claims have been made for this process, not only regarding its efficiency in cleaning castings, but also for its ability to cleanse the general foundry atmosphere, but the authors are not so foolish as to try to substantiate these claims without personal experience. Their reason for raising the matter is simply the fact that they see such enormous possibilities in this type of plant for achieving the twofold object of cleaning castings and reducing dust risk.

It is upon this slightly prophetic and optimistic note that the authors would close this section.

The authors wish to thank all those who directly or indirectly have helped in the compilation of this Paper. In addition, they would thank the directors of their company for the opportunities granted to prepare it.

CONFERENCE PAPERS

In view of the various difficulties which prevented early distribution of the preprints of the Technical Papers presented to the recent Annual Conference of the Institute of British Foundrymen, as a result of which the discussions were somewhat curtailed, members who desire to make further contributions to the discussions are reminded that such can still be made in writing to the Institute, Saint John Street Chambers, Deansgate, Manchester, 3, and will be considered by the authors. Such contributions should reach the Acting Secretary of the Institute not later than July 31 next.

CAST BRASSES A AND B (B.S.S. 1025-1028)

(*Concluded from page* 220.)

Discs made in the alloy of high copper content with additions of 0.15 to 0.5 per cent. aluminium all showed marked drawing and cracking at the root of the boss and leaked as cast. An addition of 0.04 per cent. aluminium did not cause cracking, but the castings leaked. Strip specimens cut from the gunmetal discs, the gauge lengths including the unsound part under the boss, had tensile strengths of the order of 10 tons per sq. in. Similar specimens from the brass discs had very low strengths, of the order of 3 to 7 tons per sq. in., the high copper alloys (80 per cent.) and the low-grade bronze giving rather better figures than the brasses of lower copper content.

Summary

Replies to the questionnaire indicate that brasses A and B can be satisfactorily used for small castings of thin section using technique formerly used for gunmetal.

The brass A appears to be satisfactory for pressure castings, but it may be desirable in some cases to provide more feed than is necessary for gunmetal. The use of a brass of high copper content near to the upper limit of the specification helps in obtaining pressure-tight castings. The presence of aluminium in brass A is harmful to both casting and mechanical properties. The general conclusion indicated is that brass A is suitable for simple castings, *e.g.*, of thin and uniform section, but for more difficult castings with, for example, considerable changes in sectional thickness, it is desirable to use a brass with a copper content at the upper limit of the specification (80 per cent.). The permissible working pressure of hydraulic fittings in brass A is limited by the foreword of the specification to 100 lbs. per sq. in. With certain castings of suitable design higher working pressures are permissible in this alloy, and it is suggested that this limitation be reconsidered.

Brass B is satisfactory for simple castings not required to withstand pressure. It is mainly used for thin section castings, and it is likely that for heavier sections the casting technique would have to approach that used for manganese bronze.

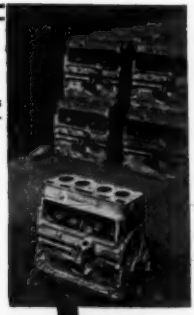
The results of the experimental work are consistent with the information obtained from the industry, and a further point arises in connection with the specification for brass B. It appears that alloys of the lowest permissible copper content (62 per cent.) and with the maximum tin content (2 per cent.) may contain large amounts of a brittle phase, with a resultant serious effect on the mechanical properties. It is suggested that the tin content of this brass should be limited to 1 per cent.

Pig-iron output in the United States in the March quarter totalled 15,290,952 tons, as compared with 15,553,602 tons in the preceding quarter (the highest on record), 14,527,626 tons in the first quarter of 1942, and 13,279,673 tons in the first quarter of 1941.

STANTON DALE

Refined PIG IRON

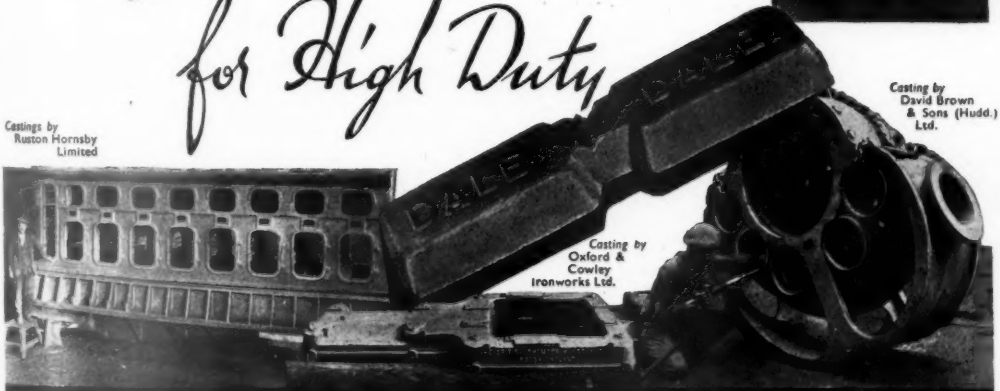
for High Duty



Castings by Morris Motors Limited.

Casting by Baker Perkins Limited

Castings by Ruston Hornsby Limited



Castings by Ruston Hornsby Limited

Casting by David Brown & Sons (Hudd.) Ltd.

Casting by Oxford & Cowley Ironworks Ltd.

THE STANTON IRONWORKS COMPANY LIMITED
NEAR NOTTINGHAM.

NEWS IN BRIEF

A STRIKE of foremen and stocktakers employed at the Middlesbrough works of Dorman Long & Company, Limited, which had lasted for some time, has ended.

MR. GEORGE HICKS, Parliamentary Secretary to the Ministry of Works, speaking at Woolwich, said that the scrap metal hunt had yielded 2,500,000 tons of iron and steel.

BOILER MANUFACTURERS in the West of Scotland are protesting to the Government against State departments placing contracts in England without giving Scottish firms an opportunity to tender.

THE ENGINEERING FIRM of Marshalls, of Gainsborough, has reverted to its original name of Marshall, Sons, & Company, Limited, after a period of seven years during which its title was Marshall, Sons, & Company (Successors), Limited.

AFTER HAVING GIVEN careful consideration to the evidence and submissions of the parties in a claim by the National Union of Foundry Workers for an allowance of 8s. per week to be paid to their members employed on maintenance work by the North British Rubber Company, Limited, the Industrial Court find that the claim has not been established and have made an award accordingly.

ALTERATIONS IN the controlled maximum prices of certain types of bolts and nuts are contained in a new Order issued by the Minister of Supply. The price list has also been extended to cover some types of aircraft bolts and nuts. Copies of the Order, the Control of Bolts, Nuts, Screws, Screw Studs, Washers and Rivets (No. 2) Order, 1943 (S.R. & O., 1943, No. 884), which came into force on July 1, may be obtained from H.M. Stationery Office, price 1d.

OUTPUT OF iron and steel ingots in Britain last year reached a record figure, declared Mr. John Brown, general secretary of the Iron and Steel Trades Confederation, at the conference at Manchester recently of more than 100 delegates representing members from the North-West England areas. He said that, as a result of the Tunisian victory, extensive supplies of ore had now become available for shipment. The conference decided to press for transfer of the iron and steel industry to public ownership and control.

Recent Wills

SANDERS, T. H., of Leeds, spring manufacturer ...	£11,201
TURNER, H. R., of Littlehampton, late of Harland & Wolff, Limited	£3,522
FLEMING, JOHN, of Armley, Leeds, late of Wilsons & Mathiesons, Limited, ironfounders	£8,552
LORD, F. A. B., chairman of W. F. Dennis & Company, Limited, iron, steel, and wire merchants, London, E.C.4.	£67,389
HUGHES, W. M., of Bilston, Staffs, late joint managing director of the Star Foundry Company, Limited, and a director of Bradsteds, Limited, ironfounders, machinery manufacturers, etc.	£24,747

PERSONAL

LORD ASHBURTON has been elected a director of the Pressed Steel Company, Limited.

MR. WALTER GARDNER has been elected chairman of the Amalgamated Metal Corporation, Limited, in place of the late Mr. C. V. Sale.

MR. HAROLD WILMOT, managing director of Beyer Peacock & Company, Limited, Manchester, has been elected president of the Institute of Cost and Works Accountants for the ensuing year.

MR. A. JOHN HUGH SMITH has been elected a director of Henry Gardner & Company, Limited, metal merchants, and has become chairman of the British Metal Corporation, Limited, in place of the late Mr. C. V. Sale.

MR. EDWARD LESLIE DENNY has been elected a director of William Denny & Bros., Limited, Leven Shipyard, Dumbarton. He has for many years been associated with the engineering department of the business.

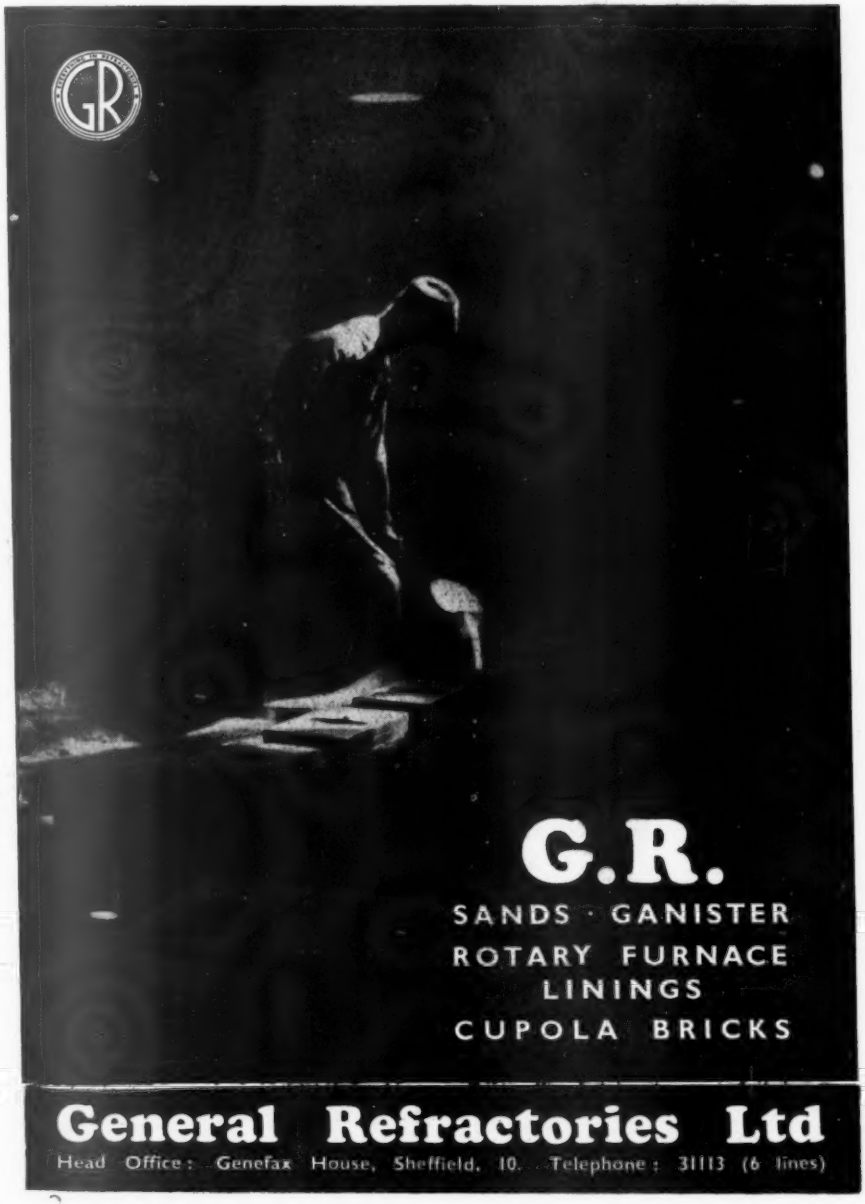
MR. W. T. TOLHURST has been appointed to the vacancy on the board of W. G. Allen & Sons (Tipton), Limited, Princes End Works, Tipton, South Staffs, caused by the death of Mr. W. H. Hand, who had been a director of the company for many years and chairman until 1938. Mr. Hand, who was a son-in-law of the original founder of the business—Mr. W. G. Allen—was in his 87th year. Mr. Tolhurst has been works manager and engineer of the company for many years and has taken an active part in the considerable developments in the extent and scope of the company's business which have taken place in recent times.

SOUTH WALES SIEMENS STEEL WORKERS

At a meeting of the joint board for the South Wales Siemens Steel Trade at Swansea last week, it was agreed, in response to a claim by the workers' side for an increase in the rate for female labourers so as to place them in the same relative position as other employees governed by the general trade agreement of January last, to grant advances amounting to 6s. a week for women and 3s. for juveniles. It was also agreed that the maximum normal wage a shift under the Essential Work (General Provisions) Order should be increased from 17s., plus cost-of-living bonus, to 18s., plus bonus.

In regard to holidays with pay, an arrangement was reached whereby £4 10s., or the average weekly wage, whichever was the lower, should be paid in respect of a holiday week.

The workers submitted a request that men transferred from the steel industry to other industries and districts during and immediately preceding the war should be reinstated in their previous jobs at the end of hostilities. The employers agree to this being done, consistent with their obligation under the National Service Act and the position of the industry after the war.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G.R.
SANDS · GANISTER
ROTARY FURNACE
LININGS
CUPOLA BRICKS
General Refractories Ltd
Head Office: Genefax House, Sheffield, 10. Telephone: 31113 (6 lines)

COMPANY NEWS

(Figures for previous year in brackets.)

Fisher & Ludlow—Dividend of 15% (same).

Rippingilles—Ordinary dividend of 7½% (6%).

George Spencer Moulton—Dividend of 5% (same).

International Combustion—Interim dividend of 5% (same).

Hammond Lane Foundry—Interim dividend of 3% (same).

Telegraph Construction & Maintenance—Interim dividend of 5% (same).

Consett Iron Company—Dividend of 7½% on the ordinary shares (same).

W. G. Allen & Sons (Tipton)—Final dividend of 7½%, making 10% (same).

Guest Keen & Nettlefolds—Final ordinary dividend of 6%, making 10% (same).

Wales—Final dividend on the ordinary shares of 7½%, making 12½% for 1942 (same).

Harland Engineering Company—Dividend on the ordinary shares of 5% for 1942 (4%).

Triplex Foundry—No dividend on the ordinary shares for the year ended March 31 (nil).

Albert Phillips (Ireland)—Loss for 1942 of £450, reducing the credit balance at profit and loss account to £1,161.

Darwins—Net profit for year to March 31, 1943, after taxation, £27,360 (£29,740); ordinary dividend of 6% (same); forward, £11,695 (£1,816).

Reason Manufacturing—Net profit to January 31 last, £4,129 (same); preference dividend, £3,024 (same); ordinary dividend of 20% (same); forward, £4,933 (£4,328).

Mellowes & Company—Net profit, £43,598 (£40,941); reserved for taxation, £30,000; ordinary dividend of 20% (same) and a bonus of 2½% (nil), £11,250 (£10,000); forward, £1,918 (£1,319).

J. Stone & Company—Profit for 1942, after taxation, £596,762; net profit, after allowances for depreciation, etc., and A.R.P., £232,126 (£214,109); preference dividend, £39,000; ordinary dividend of 25% (same); forward, £319,441 (£276,415).

Watford Electric & Manufacturing—Profit for 1942, after providing for depreciation and deferred repairs, £62,418 (£41,795); income-tax and E.P.T., £55,047 (£31,001); preference dividends for year, £1,500; ordinary dividend of 15%, less tax, £3,750 (same); reserve for buildings, £1,000; forward, £20,443 (£19,268).

Rotherham Forge & Rolling Mills Company—Profit on trading for the year ended March 31, £79,350 (£42,518); net profit, after taxation, including E.P.T., depreciation, war damage insurance, etc., £12,826 (£11,563); to reserve, £4,000; ordinary dividend of 15% (same) and a bonus of 2½% (nil); forward, £8,830 (£9,231).

Glacier Metal—Net profit for the year to February 28, £49,354 (£97,973); estimated E.P.T. recoverable, £10,000; post-war rehabilitation of factories, £6,000; employees' profit-sharing scheme, £5,500; income-tax and E.P.T., £29,141; ordinary dividend of 7½% (same); to special contingency reserve, £10,000; forward, £7,262 (£7,674).

NEW TRADE MARKS

The following applications to register trade marks appear in the "Trade Marks Journal":—

"LATEM"—Electric motors, etc. BRADFORD METAL CASE COMPANY, LIMITED, Eastwood Works, Hall Lane, Bradford, Yorks.

"HARTLID"—Manhole covers and frames. HARTLEYS (STOKE-ON-TRENT), LIMITED, Kearsley Chambers, Shelton Old Road, Stoke-on-Trent.

"HOOVERAX"—Air pumps, compressors, purifying machines, electric alternators, bearings, etc. HOOVER, LIMITED, Perivale, Greenford, Middx.

"STONE'S BRONZE A R 8" (Device)—Bronze ingots. J. STONE & COMPANY, LIMITED, Brass, Copper and Iron Works, Abinger Road, Deptford, London, S.E.14.

"ENCOGAS" and "CARMONITE"—Furnaces and plant for use in the heat-treatment of metals; gas generating plant. WILD-BARFIELD ELECTRIC FURNACES, LIMITED, Elecfurn Works, Watford By-Pass, Watford, Herts.

[*Applications to the Cutlers' Company, Sheffield.*]

"MOREX"—Hacksaw blades, metal slitting saws, hand tools, etc. DARWINS, LIMITED, Fitzwilliam Works, Templeborough, Sheffield.

"MOLYCUT"—Milling cutters, twist drills, reamers, etc. THOS. FIRTH & JOHN BROWN, LIMITED, Atlas & Norfolk Works, Savile Street, Sheffield.

"STEADFAST" (circular device)—Electrodes for electric welding, needles and springs for gramophones, etc. J. STEAD & COMPANY, LIMITED, Manor Works, Cricket Inn Road, Sheffield, 2.

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Ayrton Metals—£10,000. S. Ayrton, 10-13, Dominion Street, London, E.C.2, subscriber.

Weldfast Engineering Company, 159, Hollyhedge Lane, Walsall, Staffs—£1,000. E. L. D. L'Huillier.

Hillman & Sons (Ironfounders), 10, Richmond Street, Weston-super-Mare—£1,000. A. E. and W. A. Hillman.

Crawford-Wells, Russell Street, Wolverhampton—Engineers, metal workers, etc. £1,000. W. B. Nell and B. Bayliss.

T.A.K. Engineers, Benwell Village, Newcastle-upon-Tyne, 5—£2,000. S. S. Keel, E. Tate, C. Alexander and E. M. Lawson.

MR. DAVID BOYD, manager and a director of James Dickie & Company (Drop Forgings), Limited, Victoria Works, Ayr, has died at the age of 58. A native of Dumfries, Mr. Boyd went to Ayr 28 years ago and, joining the Victoria Works as works manager, played an important part in enlarging the scope of the business. Mr. Boyd was appointed a director in 1936, when the business was formed into a limited company.

MINISTRY OF SUPPLY

TYRES ARE A NATIONAL ASSET

don't neglect

the little

things that

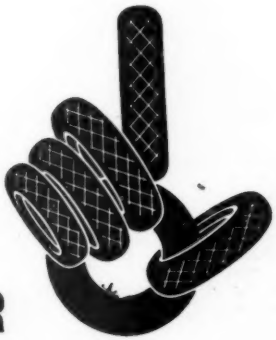
waste a

lot of rubber

Grit, flints, glass, nails can rapidly ruin a tyre without your knowing it.

In fact, left embedded in the tread they soon work through and ruin the casing.

So search for them and pick them out at the end of every journey. Otherwise they may be responsible for the total loss of a casing that *could* have been saved for retreading.



SUBMIT TYRES FOR REPLACEMENT WHEN SMOOTH

Raw Material Markets

IRON AND STEEL

The recent arrival of cargoes of iron ore from North Africa has made possible some small improvement in the output of those hematite and low-phosphorus grades of pig-iron which are specially needed for the production of engineering castings. The improvement is only relative, and to conserve supplies for future use, severe restrictions are still necessary. Hence there is still a strong run on refined iron for foundry work, and production is fully absorbed as it becomes available for distribution. Common foundry and forge irons, on the other hand, are plentiful, and the scope of buying operations since the beginning of the month has been on a very limited scale.

Foundries making heavy castings are, of course, fully employed, as their products are in continued request by Government departments and other important consumers. The position of the light-foundry trade is still that additional business is required, although there has undoubtedly been an accession of trade during the past few months. This section of the industry is, however, far from being fully engaged, and will not be until the normal flow of orders is received from the building trade.

Many users of steel bars have been slow to appreciate the possibilities of wrought-iron bars as a substitute, but conditions of scarcity have completed their education, and iron bars are now being more widely used. Producers of steel billets, blooms and sheet bars, operating under the direction of the Control, are now required to deliver specific weekly tonnages to the re-rolling mills, and are assured of outlets for their maximum production. Makers of special and alloy steels are in the same happy position, and it is believed that the expansion in the use of special steels, which has been one of the most noticeable effects of the war, will be continued in the post-war period. Heavy joists, angles and sections can be obtained at relatively short notice, but orders for light and medium sections need to be placed not less than two to three months in advance of delivery dates, and the competing requirements of the shipbuilding, tank and boiler making and wagon and locomotive industries have been swollen to such proportion that the plate mills are fully booked for still longer periods ahead. Engineering establishments, railways and collieries are also indenting for large tonnages of miscellaneous steel products. If there has been a slight easement of the pressure for sheets, the mills still have a lot of work in hand for various Government departments.

Quite good deliveries of iron and steel scrap are reported on the whole, despite the fact that consumption in the steelworks is at a record level. Every effort is still being exerted by the authorities to bring out fresh material to cover future needs. Iron-foundries are getting all the scrap they want, and many merchants have good stocks of cast iron.

NON-FERROUS METALS

Although the supply position in respect of non-ferrous metals has generally improved in recent months, it is evident that the controlling authorities do not intend as yet to permit any relaxation of their strict hold over distribution. A system of priorities has been in operation since the outbreak of the war, and it is unlikely that there will be any change in this procedure while hostilities continue. Larger tonnages of metal could undoubtedly be imported if required, but in view of the tremendous demands on shipping space and the hazardous nature of sea routes, the Control are reluctant to add to this strain. Thus non-essential consumers must be deprived of the bulk of their usual supplies. In wartime, so long as vital needs are satisfied, there can be no complaint.

NEW PATENTS

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

553,315 ABBEY, A. (Titan Company, Inc.). Treatment of ferruginous materials for the recovery of the iron content and other mineral constituents therefrom.

553,319 FRASER & FRASER, LIMITED, and HELLER, M. Apparatus for degreasing non-porous articles.

553,520 LODGE-COTTRELL, LIMITED (International Precipitation Company, Inc.). Method of and apparatus for the manufacture of electrodes for the electrical precipitation of suspended particles from gaseous fluids.

553,623 MODREY, H. J. Locating pin for temporarily holding metal or other sheets together.

553,625 CLIMAX MOLYBDENUM COMPANY. Alloying of molybdenum with molten metal.

553,649 BAKER, S. E. Rolling mills.

553,655 BYTHWAY, A. S., NEELANDS, A. R., and CEMENTATION COMPANY (SUBSIDIARIES), LIMITED. Fire resistant casings for structural steelwork.

553,573 MEEHANITE METAL CORPORATION, and SMALLEY, O. Manufacture of cast iron.

553,672 HURST, J. E., BERK & COMPANY, LIMITED, F. W., and SIX, C. G. Process for the manufacture of metal powders.

553,676 KINNEAR, R. A., and IMPERIAL CHEMICAL INDUSTRIES, LIMITED. Coating of metal surfaces.

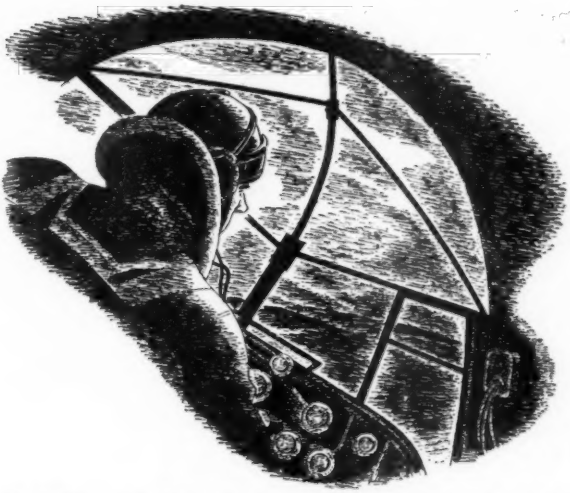
553,682 BARNEBL, A. J., GREGG, A. W., and WEBSTER, R. Foundry method and apparatus.

553,691 LINZ, A. Alloying of tungsten with ferrous metal.

553,731 OCEAN SALTS (PRODUCTS), LIMITED, and PRYTHERCH, W. E. Production of magnesium oxide from sea water brines and like liquors containing convertible magnesium.

553,737 BETHLEHEM STEEL COMPANY. Concentration of ores.

553,809 INTERNATIONAL ALLOYS, LIMITED, and PRYTHERCH, W. E. Refining aluminium and aluminium alloy scrap.



USE YOUR BLACK-OUT TO BEAT THE BOMBER

—don't let it beat you too—

Black-out atmosphere — overheated, unventilated air — undermines operatives' energy and enthusiasm, slows down effort and affects production. Health suffers. Unless efficient ventilation is installed the black-out will beat you. Consult the G.E.C., whose ventilation engineers will give expert advice on ventilation equipment specially designed for black-out conditions.

CONSULT THE G.E.C. ON VENTILATION with GENALEX EXHAUST FANS

Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2 Gen. 14

CURRENT PRICES OF IRON, STEEL AND NON-FERROUS METALS

(Delivered, unless otherwise stated)

Wednesday, July 14, 1943

PIG-IRON

Foundry Iron.—CLEVELAND No. 3: Middlesbrough, 128s.; Birmingham, 130s.; Falkirk, 128s.; Glasgow, 131s.; Manchester, 133s. DERBYSHIRE No. 3: Birmingham, 130s.; Manchester, 133s.; Sheffield, 127s. 6d. NORTHANTS No. 3: Birmingham, 127s. 6d.; Manchester, 131s. 6d. STAFFS No. 3: Birmingham, 130s.; Manchester, 133s. LINCOLNSHIRE No. 3: Sheffield, 127s. 6d.; Birmingham, 130s.

(*No. 1 foundry 3s. above No. 3. No. 4 forge 1s. below No. 3 for foundries, 3s. below for ironworks.*)

Hematite.—No. 1 (S & P 0.03 to 0.05 per cent.): Scotland, N.-E. Coast and West Coast of England, 138s. 6d.; Sheffield, 144s.; Birmingham, 150s.; Wales (Welsh iron), 134s. East Coast No. 3 at Birmingham, 149s.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, 140s. 6d., delivered Birmingham.

Scotch Iron.—No. 3 foundry, 124s. 9d.; No. 1 foundry 127s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, 174s.; South Zone, 176s. 6d.

Refined Malleable.—North Zone, 184s.; South Zone, 186s. 6d.

Cold Blast.—South Staffs, 227s. 6d.

(NOTE.—*Prices of hematite pig-iron, and of foundry and forge iron with a phosphoric content of not less than 0.75 per cent., are subject to a rebate of 5s. per ton.*)

FERRO-ALLOYS

(Per ton unless otherwise stated, basis 2-ton lots, d/d Sheffield works.)

Ferro-silicon (5-ton) lots.—25 per cent., £21 5s.; 45 per cent., £23 10s.; 75 per cent., £36 10s.

Ferro-vanadium.—35/50 per cent., 15s. 6d. per lb. of V.

Ferro-molybdenum.—70/75 per cent., carbon-free, 6s. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, 1s. 3½d. lb.

Ferro-tungsten.—80/85 per cent., 9s. 8d. lb.

Tungsten Metal Powder.—98/99 per cent., 9s. 9½d. lb.

Ferro-chrome.—4/6 per cent. C, £44; max. 2 per cent. C, 1s. 0½d. lb.; max. 1 per cent. C, 1s. 1½d. lb.; max. 0.5 per cent. C, 1s. 1½d. lb.

Cobalt.—98/99 per cent., 8s. 9d. lb.

Metallic Chromium.—96/98 per cent., 4s. 5d. lb.

Ferro-manganese.—78/98 per cent., £18 10s.

Metallic Manganese.—94/96 per cent., carb.-free, 1s. 9d. lb.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms and Slabs.—BASIC: Soft, u.t., 100-ton lots, £12 5s.; tested, up to 0.25 per cent. C, £12 10s.; hard (0.42 to 0.60 per cent. C), £13 17s. 6d.; silico-manganese, £17 5s.; free-cutting, £14 10s. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £15 15s.; case-hardening, £16 12s. 6d.; silico-manganese, £17 5s.

Billets, Blooms and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £13 17s. 6d.; basic hard, 0.42 to 0.60 per cent. C, £14 10s. 6d.; acid, up to 0.25 per cent. C, £16 5s.

Sheet and Tinplate Bars.—£12 2s. 6d., 6-ton lots.

FINISHED STEEL

[*A rebate of 15s. per ton for steel bars, sections, plates, joists and hoops is obtainable in the home trade under certain conditions.*]

Plates and Sections.—Plates, ship (N.-E. Coast), £16 3s.; boiler plates (N.-E. Coast), £17 0s. 6d.; chequer plates (N.-E. Coast), £17 13s.; angles, over 4 un. ins., £15 8s.; tees, over 4 un. ins., £16 8s.; joists, 3 in. × 3 in. and up, £15 8s.

Bars, Sheets, etc.—Rounds and squares, 3 in. to 5½ in., £16 18s.; rounds, under 3 in. to ⅜ in. (untested), £17 12s.; flats, over 5 in. wide, £15 13s.; flats, 5 in. wide and under, £17 12s.; rails, heavy, f.o.t., £14 10s. 6d.; hoops, £18 7s.; black sheets, 24 g. (4-ton lots), £22 15s.; galvanised corrugated sheets (4-ton lots), £26 2s. 6d.; galvanised fencing wire, 8g. plain, £26 17s. 6d.

Tinplates.—I.C. cokes, 20 × 14 per box, 29s. 9d., f.o.t. makers' works, 30s. 9d., f.o.b.; C.W., 20×14, 27s. 9d., f.o.t., 28s. 6d., f.o.b.

NON-FERROUS METALS

Copper.—Electrolytic, £62; high-grade fire-refined, £61 10s.; fire-refined of not less than 99.7 per cent., £61; ditto, 99.2 per cent., £60 10s.; black hot-rolled wire rods, £65 10s.

Tin.—99 to under 99.75 per cent., £275; 99.75 to under 99.9 per cent., £276 10s.; min. 99.9 per cent., £278 10s.

Spelter.—G.O.B. (foreign) (duty paid), £25 15s.; ditto (domestic), £26 10s.; "Prime Western," £26 10s.; refined and electrolytic, £27 5s.; not less than 99.99 per cent., £28 15s.

Lead.—Good soft pig-lead (foreign) (duty paid), £25; ditto (Empire and domestic), £25; English, £26 10s.

Zinc Sheets, etc.—Sheets, 10g. and thicker, ex works, £37 12s. 6d.; rolled zinc (boiler plates), ex works, £35 12s. 6d.; zinc oxide (Red Seal), d/d buyers' premises, £30 10s.

Other Metals.—Aluminium, ingots, £110; antimony, English, 99 per cent., £120; quicksilver, ex warehouse, £68 10s. to £69 15s.; nickel, £190 to £195.

Brass.—Solid-drawn tubes, 14d. per lb.; brazed tubes, 16d.; rods, drawn, 11¼d.; rods, extruded or rolled, 9d.; sheets to 10 w.g., 10¼d.; wire, 10¼d.; rolled metal, 10¼d.; yellow metal rods, 9d.

Copper Tubes, etc.—Solid-drawn tubes, 15½d. per lb.; brazed tubes, 15½d.; wire, 10d.

Phosphor Bronze.—Strip, 13¾d. per lb.; sheets to 10 w.g., 14¾d.; wire, 16d.; rods, 16d.; tubes, 21¼d.; castings, 19d., delivery 3 cwt. free. 10 per cent. phos. cop. £35 above B.S.; 15 per cent. phos. cop. £43 above B.S.; phosphor tin (5 per cent.) £40 above price of English ingots. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 10d. to 1s. 4d. per lb.; rolled to 9 in. wide, 1s. 4d. to 1s. 10d.; to 12 in. wide, 1s. 4¼d. to 1s. 10¼d.; to 15 in. wide, 1s. 4¼d. to 1s. 10¼d.; to 18 in. wide, 1s. 5d. to 1s. 11d.; to 21 in. wide, 1s. 5½d. to 1s. 11½d.; to 25 in. wide, 1s. 6d. to 2s. Ingots for spoons and forks, 10d. to 1s. 6¼d. Ingots rolled to spoon size, 1s. 1d. to 1s. 9½d. Wire round, to 10g., 1s. 7½d. to 2s. 2½d., with extras according to gauge. Special 5ths quality turning rods in straight lengths, 1s. 6½d. upwards.

NON-FERROUS SCRAP

Controlled Maximum Prices.—Bright untinned copper wire, in crucible form or in hanks, £57 10s.; No. 1 copper wire, £57; No. 2 copper wire, £55 10s.; copper firebox plates, cut up, £57 10s.; clean untinned copper, cut up, £56 10s., braziery copper, £53 10s.; Q.F. process and shell-case brass, 70/30 quality, free from primers, £49; clean fired 303 S.A. cartridge cases, £47; 70/30 turnings, clean and baled, £43; brass swarf, clean, free from iron and commercially dry, £34 10s.; new brass rod ends, 60/40 quality, £38 10s.; hot stampings and fuse metal, 60/40 quality, £38 10s.; Admiralty gunmetal, 88-10-2, containing not more than ½ per cent. lead or 3 per cent. zinc, or less than 9½ per cent. tin, £74 10s., all per ton. ex works.

Returned Process Scrap.—(Issued by the N.F.M.C. as the basis of settlement for returned process scrap, week ended July 10, where buyer and seller have not mutually agree a price; net, per ton, ex-sellers' works, suitably packed):—

BRASS.—S.A.A. webbing, £48 10s.; S.A.A. defective cups and cases, £47 10s.; S.A.A. cut-offs and trimmings, £42 10s.; S.A.A. turnings (loose), £37; S.A.A. turnings (baled), £42 10s.; S.A.A. turnings (masticated), £42; Q.F. webbing, £49; defective Q.F. cups and cases, £49; Q.F. cut-offs, £47 10s.; Q.F. turnings, £38; other 70/30 process and manufacturing scrap, £46 10s.; process and manufacturing scrap containing over 62 per cent. and up to 68 per cent. Cu, £43 10s.; ditto, over 58 per cent. to 62 per cent. Cu, £38 10s.; 85/15 gilding metal webbing, £52 10s.; 85/15 gilding defective cups and envelopes before filling, £50 10s.; cap metal webbing, £54 10s.; 90/10 gilding webbing, £53 10s.; 90/10 gilding defective cups and envelopes before filling, £51 10s.

CUPRO NICKEL.—80/20 cupro-nickel webbing, £75 10s.; 80/20 defective cups and envelopes before filling, £70 10s.

NICKEL SILVER.—Process and manufacturing scrap: 10 per cent. nickel, £50; 15 per cent. nickel, £56; 18 per cent. nickel, £60; 20 per cent. nickel, £63.

COPPER.—Sheet cuttings and webbing, untinned, £54; shell-band plate scrap, £56 10s.; copper turnings, £48.

IRON AND STEEL SCRAP

(*Delivered free to consumers' works. Plus 3¾ per cent. dealers' remuneration. 50 tons and upwards over three months, 2s. 6d. extra.*)

South Wales.—Short heavy steel, not ex. 24-in. lengths, 82s. to 84s. 6d.; heavy machinery cast iron, 87s.; ordinary heavy cast iron, 82s.; cast-iron railway chairs, 87s.; medium cast iron, 78s. 3d.; light cast iron, 73s. 6d.

Middlesbrough.—Short heavy steel, 79s. 9d. to 82s. 3d.; heavy machinery cast iron, 91s. 9d.; ordinary heavy cast iron, 89s. 3d.; cast-iron railway chairs, 89s. 3d.; medium cast iron, 79s. 6d.; light cast iron, 74s. 6d.

Birmingham District.—Short heavy steel, 74s. 9d. to 77s. 3d.; heavy machinery cast iron, 92s. 3d.; ordinary heavy cast iron, 87s. 6d.; cast-iron railway chairs, 87s. 6d.; medium cast iron, 80s. 3d.; light cast iron, 75s. 3d.

Scotland.—Short heavy steel, 79s. 6d. to 82s.; heavy machinery cast iron, 94s. 3d.; ordinary heavy cast iron, 89s. 3d.; cast-iron railway chairs, 94s. 3d.; medium cast iron, 77s. 3d.; light cast iron, 72s. 3d.

(NOTE.—*For deliveries of cast-iron scrap free to consumers' works in Scotland, the above prices less 3s. per ton, but plus actual cost of transport or 6s. per ton, whichever is the less.*

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HEAD FOUNDRY FOREMAN desires change; specialist in magnesium alloy sand castings; fully conversant with aircraft components to A.I.D. specifications; practical experience in green and dry sand moulding, machine and general jobbing work; strict disciplinarian.—Box 942, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

METALLURGIST or Foreman required to take charge of Tropenas Plant in small Steel Foundry; must be fully conversant with cupola and converter; steel castings mixtures subjected to Admiralty test and requirements; permanency.—Box 944, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

HEAD FOUNDRY FOREMAN required; foundry, South Yorkshire; engaged on domestic stoves and grates; light engineering and electrical castings up to 5 cwts.; able to estimate labour costs, also time and piece rates, from patterns and drawings; plan foundry output; supervise metal mixing and cupola, sand mixing, and coremaking; permanency for suitable applicant.—Box 940, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

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TUBE Fittings REPRESENTATIVE wanted; live man; experienced in tubes and fittings; state age, experience, salary; exempt.—Box 936, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

REPRESENTATIVE (exempt), Midlands area; preferably some knowledge furnace construction; to sell foundry equipment. State age, experience.—Box 914, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

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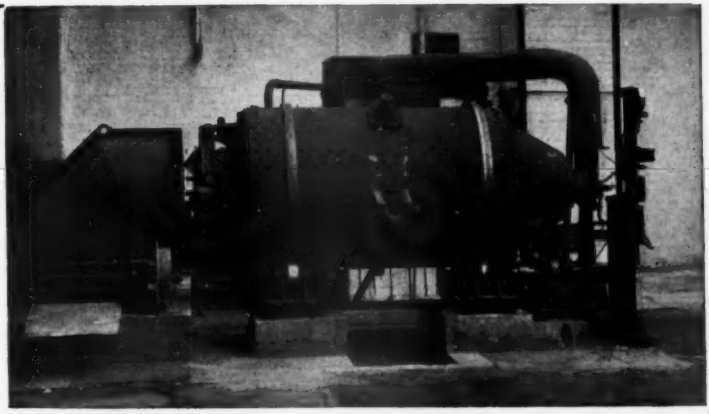

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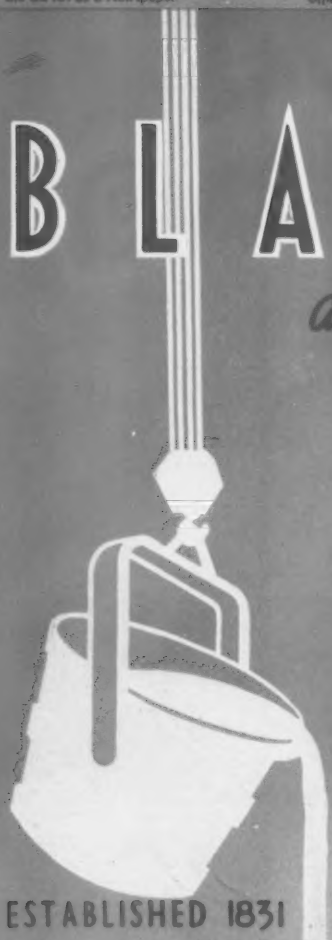

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